

In the Specification:

Please replace the paragraph beginning on page 20, line 23, with the following rewritten paragraph:

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--Figures 4a, 4b, and 4c show cross section views of the present invention, and may be examined in conjunction with corresponding sections a-a, b-b, and c-c of figure 4. A plurality n of electron guns, illustrated for the case n=8
10 and shown as 230a, 230b, ..., 230h ~~230n~~ is arranged circularly around a central axis Z 150. A reference plane R is perpendicular to the axis Z 150, and is used in the illustrations for section a-a, b-b, and c-c. Figures 4a-4c show a cross section view of a device. Each electron gun
15 230a...h ~~230a...n~~ is arranged circularly around the central axis Z and produces a beamlet which initially focuses to a minimum diameter 106a...h ~~106a...n~~, as described earlier in figure 2. As is clear to one skilled in the art, other non-circular and irregular inter-gun spacings can be used, but
20 the regular spacings and circular arrangement is shown for clarity in the drawings. Each beamlet from each electron gun 230a...n ~~230a...h~~ travels through its own beam tunnel 156a...n ~~156a...h~~ along a beam tunnel axis 152a...n ~~152a...h~~ to a collector 112a...n ~~112a...h~~. Each beamlet travels in its
25 respective beam tunnel axis 152a...g ~~152a...h~~ which has a conductive inner surface 173, and the beam tunnel comprises

Amendment for: Electron Gun for Multi-Beam Klystron by Ives et al. s/n 09/629,364

drift tubes 133, 135, 137, and 139, and a series of resonant cavities 172, 174, 176 formed by drift tube gaps along each beam tunnel axis ~~152a..n~~ 152a..h and beam tunnel ~~156a..n~~ 156a..h, and shown in figure 4-1 detail. These cavities are
5 for the introduction of RF power, additional modulation of the electron beamlets, and the extraction of RF power, as before. The coaxial magnetic flux field generator 130 (shown in figure 4) comprises a coil wound around the axis 150, which produces a generally uniform flux field 132
10 (shown in figure 4) aligned with the central axis 150, as before. The resonators are shown as 172, 174, 176 comprise the annular ring resonators described, for example, in U.S. Patent No. 4,508,992 by Bohlen et al (items 1 and 2), incorporated herein by reference. A key feature of the
15 embodiment shown in Fig. 4 is the presence of an iron structure 170 and electromagnetic coil or permanent magnet 180, located along the centerline of the device and positioned at the approximate location of the individual cathodes 102. The iron structure 170 and magnet 180 provide
20 compensation for the radial asymmetry of the magnetic field at the location of the individual cathodes 102a..h (cathodes 102a and 102e only are visible in figure 4 section view), as will be described later.--

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Please replace the paragraph beginning on page 23, line 19, with the following rewritten paragraph:

5 --An embodiment of the magnetic circuit for the device of Fig. 4 is shown in Fig. 6a. A shell of magnetic iron 140 encloses magnetic coils 130 that generate the main magnetic field 132 for the RF device. As is clear to one skilled in the art, it would be possible to substitute a self-magnetic
10 structure such as a permanent magnet for the coil 130 with appropriate modifications to iron structure 140. Apertures 210 are placed in the end walls of the shell 140 to allow passage of the electron beamlets 106a..h (shown in figure 4) and to allow magnetic flux to extend into the cathode-anode
15 regions 101 (not shown) of the electron guns 230 (not shown) to aid in beam focusing. An auxiliary electromagnet coil or permanent magnet 180 is located along the device centerline 220 and between the centerline and the individual electron guns 230. In addition magnetic material 170 is located along
20 the device centerline 220 and between the electron guns 230 and the centerline 220. The magnetic material (i.e. iron) ~~iron~~ 170 may include semicircular extensions 178 extending partially around the centerline of each individual beamlet 217 to reduce azimuthal asymmetries in the magnetic field at

the location of the individual cathodes 102 (shown in figure 4).--

- 5 Please replace the paragraph beginning on page 25, line 7, with the following rewritten paragraph:

Figure 6c shows equipotential magnetic flux lines in the vicinity of the electron beam aperture 210 with
10 auxiliary coil 180 (shown in the magnetic circuits of figures 4, 6a, 7, and 9) and magnetic material 170 (shown in the magnetic circuit of figures 4, 6a, 7, and 9). It can be seen that the equipotential magnetic flux lines 336 and the electron beam paths 340 are perpendicular. Thus the
15 direction of electron motion from the emitting surface 101 of the cathode 102 is parallel to the magnetic force direction, eliminating magnetically induced forces perpendicular to the direction of electron motion, which causes the electron beam entering aperture 210 to experience
20 confined flow with no trajectory divergence or beam spreading. The emitting surface 101 is thermionically emitting electrons towards the aperture 210 due to heating of the cathode 102 and the accelerating presence of an anode (not shown), as was described in prior art figure 2. Shell

140 and beam beam tunnel axis 152 were described in figure 4.

Please replace the paragraph beginning on page 26, line 14, with the following rewritten paragraph:

--Figure 9 shows the device of figure 4 wherein the iron materials 140 (shown on figure 4) and magnetic coils 130 (shown in figure 4) are replaced by iron materials 250, 251, and permanent magnet 254, respectively. Certain structures from figure 4 are shown in figure 9 for clarity including electron guns 230a and 230e; beamlet focusing to minimum diameter 106a and 106e, central axis 150, iron structure 170, thermionic emitting surface 102a and 102e, resonators 172, 174, and 176, cathode centerline 152a and 152e; electron collector 112a and 112e; inner surface 173; magnet 180; beam tunnels 156a and 156e; and outer surface 171.--

Please replace the paragraph beginning on page 26, line 17, with the following rewritten paragraph:

--Figure 10 shows an alternate embodiment of the multiple beam device where additional magnetic material 260 is incorporated at a larger radius than the electron guns

230 (not shown) whose electron beams 106 (not shown) pass through apertures 210 and interior to outer magnetic coil 232 (shown in figure 7) or permanent magnet ~~232~~ 240 (shown in figure 8). The magnetic material may contain specially shaped surfaces 264 to further correct the magnetic field for radial or azimuthal asymmetries in cooperation with coils 232 and 180 and interior magnetic structure 170. Cutouts 178 are present in iron 170 and magnetic material 260 adjacent to shell 140.--

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